

manner, in order not to show that he knew and recognised the theory of descent, and that he knew exactly how man has originated and whence he comes. If indeed he did not know where man goes to, yet he would at least believe that he knew for certain how in the course of æons the progressive series shaped itself. Therefore I say that if we really did not demand the admission of the theory of descent into the educational plan, this would yet be accomplished of its own accord.

We certainly should not forget, gentlemen, that what here we express, perhaps still with a certain timid reserve, is propagated by those outside with a confidence increased a thousand-fold. For instance, I have once pronounced the phrase—in opposition to the doctrine then reigning of the development of organic life from inorganic matter—that each cell had its origin in another cell, indeed at that time with special reference to pathology, and principally with regard to man himself. I may remark here that in both relations I still to-day consider this phrase a perfectly correct one. But when I had pronounced this doctrine and had formulated the origin of the cell from the cell, others were not wanting who extended this phrase not only in the organic world far beyond the limits for which I had intended it, but who put it down as generally valid even beyond the limits of organic life. I have received the most wonderful communications both from America and Europe, in which the whole of astronomy and geology were based upon the cellular theory, because it was thought impossible that something which was decisive for the life of organic nature upon this earth should not be equally applied to the heavenly bodies, which were said to be round bodies after all, and which had shaped themselves into globes and represented so many cells flying about in universal space and playing a part there similar to that of the cells in our body.

I cannot say that the authors of these communications were all decided fools and simpletons; on the contrary, from some of their explanations I gained the idea that many an otherwise educated man, who had studied much and finally attacked the problems of astronomy, could not understand that the utility of heavenly phenomena should be based upon something else than the utility of human organisation, so that he, in order to gain a monistic conception eventually arrived at the supposition that the heaven must also be an organism, that indeed the whole world must be an organism of useful arrangement, and that no other principle but that of the cells could apply to it. I cite this only in order to show what shape things take outside, how "theories" are enlarged, and how our own doctrines may return to us in a form fearful to ourselves. Now only imagine how the theory of descent may be shaped to-day in the head of a socialist!

Indeed, gentlemen, this may seem ridiculous to many, but it is very serious, and I only hope that the theory of descent may not bring all those horrors in our country which similar theories have actually brought to our neighbours. Anyhow this theory, if carried through to its consequences, has an extremely dangerous side and that the socialists have a certain notion of it already, you will doubtless have remarked. We must make this quite clear to ourselves.

Nevertheless the matter might be as dangerous as possible, the confederates might be as bad as they could be, and yet I say, from the moment when we are convinced that the theory of descent is a doctrine perfectly proved, so certain that we could swear by it, that we could say, thus it is,—from that moment we must not hesitate to introduce it into general life, transmit it not only to every educated person, but teach it to every child, make it the basis of our whole conception of the universe, of society, and of the state, and found our educational system upon it. This I consider a necessity.

In saying this I am not at all afraid of the reproach, which to my astonishment has made a great noise in my Prussian Fatherland, while I was absent in Russia, I mean the reproach of *half-knowledge*. Strange to say, it was one of our so-called liberal journals which asked the question whether the great faults of our time, and socialism in particular, were not based upon the diffusion of half-knowledge. With reference to this I would like to state here, in the midst of the Naturalists' meeting, that *all* human knowledge is only piece-work. All of us who call ourselves naturalists, only possess pieces of natural science; none of us is able to come here and represent each science with the same right, or participate in the discussions of any scientific section. On the contrary, it is just because they have developed themselves in a certain one-sided direction, that we esteem the special scientific men so highly. On the other fields we are all in half-knowledge as it were. Oh! that we could only succeed in diffusing this

half-knowledge more and more, if we could succeed in causing at least the majority of educated persons to progress far enough to be able to survey the principal directions which the single departments of natural science are taking, and to follow their development without meeting difficulties too great to be overcome, so that they would at least be aware of the general progress of science, if, indeed, they were not acquainted, at every moment, with the totality of all single and special proofs. We do not get much further ourselves. I, for instance, have honestly tried during my time of life to obtain chemical knowledge; I have even worked in a laboratory, but I feel thoroughly incompetent to sit down at some chemical meeting without preparation, and to discuss modern chemistry in all directions. Nevertheless I am able to penetrate, after a time, so far into any chemical novelty that it does not strike me as incomprehensible. But I must always first acquire this understanding, I have not got it to start with; and when I want it again I must acquire it again. That which honours me is the *knowledge of my ignorance*. The most important part is that I know perfectly well what I do not know of chemistry. If I did not know that then of course I should always be wavering to and fro. But as I imagine that I am tolerably well aware what I do not know, I say to myself every time I am obliged to enter a domain which is still closed to me: "Now I must begin again to learn, now I must study afresh, now I must do as anybody does who enters the domain of science." The great error, which is equally shared by many educated people, consists in not remembering that with the enormous extent of natural science and with the inexhaustible quantity of detailed material, it is impossible for any single person alive to command the totality of all these details. That we get far enough to know the *foundations* of natural science and the gaps which exist in our own knowledge, so that every time we find a gap of this kind we say to ourselves,—“Now you enter a domain which is unknown to you,”—that is what we must arrive at. If everybody was only sufficiently aware of this, many a one would beat his breast and own that it is a dangerous thing to draw general conclusions with regard to the history of all things when one is not even entirely master of the material from which these conclusions are to be drawn.

(To be continued.)

### UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—This term has witnessed the election of two new Natural Science fellows. Mr. A. M. Marshall, Senior in the Tripos of 1874, has been elected at his own College, St. John's. His able papers on Embryology have been an important addition to the researches which are making the British school again famous in this subject, and he is the first Doctor of Science in Comparative Anatomy in the University of London. Two of the newly-elected fellows of St. John's are taking to Medicine, viz., Dr. Marshall and Mr. McAlister, the last Senior Wrangler. At Trinity the open fellowship has been adjudged for the first time to a non-member of the College, Mr. J. N. Langley, B.A., of St. John's, whose services as Demonstrator of Physiology to Dr. Foster are most highly appreciated, while his originality and perseverance in research will, before long, be much more widely known than at present. I understand that the aid of Prof. Huxley was called in, giving the highest guarantee to the examination in Biology, and that several candidates showed themselves in every way worthy of a fellowship, especially in the original memoirs which were sent in before the examination.

The new buildings for anatomy and physiology are advancing to completion and are partially occupied, Mr. Balfour's two practical courses of Comparative Anatomy being accommodated in them. Dr. Foster will transfer much of his work here after Christmas. The new buildings will be almost too small as soon as completed, for Dr. Foster has fifty men and several ladies working in his elementary classes this term, a very large number when it is considered that this is voluntary and not prescribed work. It is but a just tribute to Dr. Foster's rare value as a teacher who makes his students think, who sacrifices his time most indefatigably for their interests, and who cultivates the powers of investigation developing in his pupils with all the care of a parent. Instead of engrossing authority to himself, he sets his senior pupils to lecture on the subjects they make a special study; thus during the present winter the advanced class will receive lectures from Dr. Gaskell, Mr. Langley, and Mr. Lea. Mr. Vines has returned from working in Germany

with Sachs, and is lecturing to a large class on Vegetable Physiology. Next year he will start the first practical course of botany, and, being unable to induce his college to provide apparatus for a laboratory, intends to furnish it at his own expense. Among other lectures in natural science Prof. Dewar's on Physical Chemistry are taking high rank. It is to be noted that Mr. Apjohn, the late lamented Prælector of Chemistry at Caius College, was to have received a fellowship this term by special vote of the whole of the fellows. The prælectorship is to be continued mostly in its old form, but it is worthy of note that the prosecution of original research is put prominently among the duties of the office, as well as the instruction of students from the University generally. There are nearly a score of candidates, including such well-known names as Mr. W. Noel Hartley, Dr. J. T. Bottomley, and Dr. Dittmar.

Prof. Clerk Maxwell greatly interested the Philosophical Society at its last meeting by an account of Henry Cavendish's unpublished writings and experiments on electricity. He was not generally known to have done much electrical work, and his papers were long in the hands of Sir W. Snow Harris, who is declared by Prof. Maxwell, after careful examination, to have made no use of Cavendish's work without full and adequate acknowledgment. These writings are left in a form quite fitted for publication, and will greatly advance the reputation of the great philosopher. His exactness, his candour, his grasp of the subject, his notable achievements with the small variety of instruments available in his time, were fully shown by the examples cited to the Society. Yet these were less than his remarkable insight into electrical laws, his correct conception of potential, his ideas of investigating the total charges of bodies, and the resistance of electrolytes. Prof. Maxwell thought that nobody had ever possessed so large and various a collection of condensers of known capacity as Cavendish, but his family taciturnity prevented his merits from being fully known. He trained himself to be his own galvanometer, and the general value of his results is remarkable when compared with those obtained by modern instruments.

In regard to university reform, it appears that in some colleges at least there is a danger of the non-resident fellows, who form the largest proportion of the governing body under the act, endeavouring to maintain at a very high number the fellowships to which no duties are attached; of course every such fellowship diminishes the funds available for definite association with the progress of research and education. Some men hold very strongly to the "start in life" theory of fellowships; viz., that they ought to receive three hundred a year for a number of years in order that they may gain three thousand a year in a profession the more speedily.

GLASGOW.—Mr. Gladstone has been elected Lord Rector of Glasgow University in succession to the Earl of Beaconsfield.

BERLIN.—The well-known botanist, Prof. Sachs, of Würzburg, has received a very flattering call to Berlin. Neither pains nor money seem to be spared by the Prussian Government in attracting to the capital the foremost talent of Germany; and certainly in this choice of a successor to Alexander Braun no change of policy is shown.

GÖTTINGEN.—The sum of 50,000 marks has recently been appropriated for the erection of a phyto-physiological institute in the Botanical Gardens.

GIESSEN.—In consequence of the late discussions excited by Prof. Meppsen's articles on the Ph.D. examinations in Germany, the University of Giessen has issued an announcement stating that for the future no faculty can bestow the title of Doctor, except on the basis of a thesis and oral examination.

DORPAT.—The winter attendance at the university is 853, of whom but seven are non-Russian.

BRUNSWICK.—On October 16 interesting ceremonies took place at the opening of the magnificent new buildings of the Carolo-Wilhelminum Polytechnic, in which representatives of the Government, and delegates from all the great German polytechnics, took part. The new edifices are of great extent, and richly equipped with all possible adjuncts for modern technical education, so that this well-known institution will be able to maintain its well-earned reputation. The Carolo-Wilhelminum is the oldest polytechnic in Germany, having been founded in 1745, and the list of its students embraces many distinguished names, such as Gauss, the mathematician, Christopher Codrington, the English commander at the naval victory of Navarino, &c.

## SOCIETIES AND ACADEMIES

### LONDON

Chemical Society, November 15.—Dr. Gladstone in the chair.—The following communications were made:—First report to the Chemical Society on some points in chemical dynamics, by Dr. Wright and Mr. Luff. An elaborate series of experiments was made to find out the temperatures at which the actions of carbonic oxide, hydrogen, and free amorphous carbon on oxide of iron or oxide of copper are first perceptible. The authors find that this temperature varies with the physical condition of the oxide used, that hydrogen acts, on a given oxide, at a lower temperature than carbon and carbonic oxide, at a lower temperature than hydrogen, and that a given reducing agent begins to act on copper oxide at a lower temperature than on iron oxide.—On the chemistry of cocoa butter, Part I.; two new fatty acids, by C. T. Kingzett. The first acid is a low acid of the series,  $C_{18}H_{34}O_2$ , having the formula  $C_{18}H_{34}O_2$ , i.e., lauric acid, but it melts at  $57^{\circ}5$ . The second acid is a high acid having the formula  $C_{64}H_{128}O_2$ , crystallising in microscopic needles or granules, melts at  $72^{\circ}2$ , and at a high temperature distils apparently unchanged. The author proposes for it the name of theobromic acid. It is pointed out that the usual statement in books, "that cocoa butter yields almost exclusively stearic acid" is entirely incorrect.—The third paper was on the influence exerted by time and mass on certain reactions in which insoluble salts are produced, by Mr. M. P. Muir. The author has taken solutions containing known quantities of calcium chloride and potassium or sodium carbonate mixed, allowed to stand for a certain number of minutes, and then estimated the quantity of calcium carbonate formed. He has arrived at the following conclusions:—That the greater portion of the chemical change takes place during the first five minutes; the reaction then decreases in rapidity. The relative masses of the salts exert an important influence. Thus if the mass of alkaline carbonate be four times that required, the action is completed in five minutes, but if an equivalent quantity only be present the action is not finished in forty-six hours. Potassium carbonate yields more calcium carbonate in a given time than sodium carbonate. An increase of temperature increases, whilst dilution, especially with solutions of potassium or sodium chloride, diminishes the rapidity of the action. Some experiments are given on the action of solutions of calcium sulphate and sodium chloride.

Entomological Society, November 7.—Prof. Westwood, president, in the chair.—Mr. McLachlan exhibited ten of the thirteen species of Lepidoptera collected by Capt. Feilden and Mr. Hart in Grinnell Land, between  $78^{\circ}$  and  $83^{\circ}$  N. lat; during the recent Arctic Expedition, and made some remarks upon the general insects of the Arctic Regions.—The Rev. A. Eaton also made some observations upon the same subject.—Mr. Meldola exhibited a five-winged specimen of *Gonepteryx rhamni*, taken in Norfolk by Mr. John Woodgate; likewise a gynandromorphic specimen of *Pieris brassicae*, caught in Oxfordshire by Mr. J. B. Watson. The right half of the latter insect was female and the left half male.—Mr. H. Goss exhibited a gynandromorphic specimen of *G. rhamni*, captured in Sussex; in this insect also the right side was female and the left side male.—Mr. J. W. Douglas exhibited a specimen of *Polyphylla fullo*, Linn., which had flown on to a steamer at Antwerp, and been thus brought to this country. Mr. Douglas also exhibited a specimen of the rare *Tettigometra impressopunctata* and one of *Typhlocyba debilis*, both taken on Sanderstead Downs; and likewise, for comparison, an example of *T. tenerrima*.—Mr. W. C. Boyd exhibited a larva of *Pieris rapæ* attacked by *Microgaster*.—The president read notes on exotic Coleoptera, and exhibited specimens of *Calometopus Nyassa*, *Amblyodus Nicaragua* and drawings of other species.—Prof. Westwood also remarked upon an Indian *Mantis* (*Gongylus gongylodes*) which had been recently described by Dr. Anderson in the *Proceedings* of the Asiatic Society of Bengal for August, 1877, as being a simulator of a flower to a remarkable degree of perfection.—Mr. Wood-Mason also made remarks upon the same subject and upon stridulating organs in crustaceans with reference to a letter on this subject by Mr. Saville Kent in this journal (vol. xvii. p. 11). Mr. Wood-Mason likewise announced the discovery of a stridulating apparatus in a *Phasma*.—Sir Sydney Saunders read a note on the specific identity of the Hampstead *Atypus*. Mr. F. Enoch exhibited and made remarks upon a male and female of this spider.—The following papers were read:—Descriptions of new species of the coleop-